FASTag on highways

GROUP 4

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Content

Introduction

- Since traffic on highways is increasing day by day, there is a need to maintain highways and create new highways which lead to economic and social development of a nation.

- For that purpose, government charges tax on vehicles on highways generally known as toll tax.

- There are some ways to collect these taxes like:
  - Using toll booth to manually charge every vehicle passing through a booth
  - Using FASTag to automatically deduct toll tax money from vehicle owner’s bank account.

Indian Highways

Indian Highways

- Highways: a main road, especially one connecting major towns or cities.
- Indian Highways are owned by the Ministry of Road Transport and Highways, Indian Government.
- India has 151,019 km (93,839 mi) of National Highways as of March 2021.
- National Highways constituted 2.91% of India's total road network, but carried about 40% of road traffic.
- Longest National Highway in India is NH-44 (Srinagar to Kanyakumari) at 3,508 km (2,180 mi).
- Shortest National Highway in India is NH-966B which covers a distance of 8 kilometres (5.0 miles) between Kundannoor and Willingdon Island in Kochi.

Source: National highways of India - Wikipedia

Importance

- Important for transportation of goods across the lengths and breadths of India.
- Provides conveyance to the people, goods, raw materials, etc., to reach different parts of the country.
- Only source of communication in hilly regions.
- Improves connectivity to village areas leading good medical facilities.
- Generates more employment opportunities.
- Improves the land value.
- Helps in agricultural, dairy, tourism, fisheries development.
- They play important role in defence activities.
- They become the symbol of country's progress and development.

Source:
Highway Engineering - Definition, Importance, Characteristics & Classification of Highways (brandedcivil.com)

Contribution of Highways in development

- The pulsating economy of a country depends on the roads that serve as its arteries.
- By linking producers to markets, workers to jobs, students to school, and the sick to hospitals, roads are vital to any development agenda.
- Highways helps in increasing the social development of a country by connecting people of different cultures.
- Roads have a positive effect on economic growth and societal development.
- Construction of roads support commerce and communication between people and countries
- Increases living standards and economic activity and it has been a driver for peace and prosperity.

Source: https://blogs.worldbank.org

Toll Collection

- Toll is the Amount that vehicle have to pay while crossing the interstate highways, bridges or tunnels.

- Toll Plaza
  - Manually operated
  - Car will stop at Each Booth
  - Operator will collect Cash & provide receipt
  - Gate open, either mechanically or electrically

- After Paying the toll tax, in case of two way ticket, receipt needs to preserve to show at further toll booth.

Toll Collection

- Amount of toll is calculated based on
  - Length of toll Road (Usually 60km)
  - Infrastructure type (bridge, tunnel, bypass)
  - Type of vehicle
- Let's Say we're Going from Delhi to Lucknow

Toll location	One way	Return	Monthly
Yamuna Expy **Start:** Jewar **End:** Hazipur Khera	₹415.00 ₹830.00	₹665.00	₹13,695.00
Taj Express Hwy **Exit:** Inner Ring Rd, ADA, Raipur	₹35.00 ₹70.00	₹52.50	₹1,155.00
Agra Lucknow Expy **Start:** Agra **End:** Lucknow	₹600.00 ₹1,200.00	₹940.00	₹19,800.00

Source: https://tollguru.com/toll-calculator-india

Toll Collection

- Let us consider a very efficient Toll Collection System is very efficient i.e time taken for overall collection of toll for every vehicle is only 50s, then total time taken in a month is 50s x 30 = 1500s. Hence for 1 year time becomes 18000s i.e. 5 hours.
- If Each day 200 cars passes then yearly 72000 cars have to wait 5 hours at toll plaza on an average.
- There are 566 toll plazas as per NHAI.
- That much time corresponding to wastage of fuel, time and money. Also, Pollution problem will also arise.

Source : https://www.researchgate.net/publication/325712923_A_Comparative_Study_of_Toll_Collection_Systems_in_India

Problems

- As mentioned above vehicle may have to wait in queue for sometime
  - Due to absurd amount of toll i.e 54 or 83 Rs
  - Absence of the Staff
  - Malfunctioning of the System
- Wrong Lane Driving
  - Lack of Sense of Driving
  - Missing Exit Signs
- Bad Conditions of Roads in Highways.
  - Potholes
  - Heavy Overloaded Trucks
- Overspeeding
  - accidents

Source:
https://www.moneylife.in/article/six-problems-with-indian-highways-and-11-ways-to-improve-them/37976.html

Solutions

- There must be speed-capture cameras installed in highways to control the problem of overspeeding.
- Compulsory surveillance of road condition after every certain period of time.
- Enforcement of laws against the overloading of Trucks etc.
- For solving the queuing problem at toll plaza, online toll transaction system should be implemented i.e. FASTag

FASTag

History of Electronic Toll Collection

- **1959**: William Vickrey proposed a system of electronic tolling in which each vehicle was equipped with a transponder
- **1970**: free flow tolling was successfully tested with vehicles equipped with transponders at undersides and readers located under the surface of the highways
- **1986**: Electronic toll collection technology was first introduced in Bergen, Norway, operating together with traditional booths.
- **1991**: World's 1st completely unaided full-speed electronic tolling system was introduced in Trondheim.
- **1995**: Portugal became the first country to apply a single, universal system to all tolls in the country.
- **2005**: Santiago, Chile became the world’s first city with 100% full-speed electronic trolling with transponders in a system of severn urban freeways.
- **2007**: United Arab Emirates (UAE) implemented a similar road toll collection in Dubai.

History Of FASTag In India

- **2014:** The system was initially setup as a pilot project in 2014 on the stretch of the Golden Quadrilateral between Ahmedabad and Mumbai.
- **4th Nov 2014:** The system was implemented on the Delhi-Mumbai arm of the Quadrilateral.
- **July 2015:** toll plazas on the Chennai-Banglore stretch of the Golden Quadrilateral started accepting FASTag payments
- **April 2016:** FASTag was rolled out to 247 toll plazas on national highways across India, representing 70% of all toll plazas in the country at the time.
- **23rd Nov 2016:** 347 free plazas out of 366 on national highways across the country accepted FASTag payments.
- **1st Oct 2017:** the NHAI launched FASTag lane in 370 toll plazas under its ambit.
- **8th Nov 2017:** NHAI made FASTag mandatory on all new vehicles sold in India after December 2017.
- **19th Oct 2019:** It was announced that FASTag will be mandatory on all National Highways from 1st December 2019 and non-FASTag users will be charged double the toll.
- **Nov 2019:** Hyderabad airport launched FASTag Car Parking facility.
- **1st Jan 2021:** FASTag was made mandatory at every toll plaza in the country. (later date was postponed to 15th Feb 2021)

FASTag

- FASTag is an electronic toll collection system in India, operated by the National Highway Authority of India (NHAI)
- It is affixed on the windscreen of the vehicle and enables to drive through toll plazas without stopping for transactions.

TAG Class	Vehicle Description
4	Car / Jeep / Van/ Tata Ace and similar mini light commercial vehicle
5	Light Commercial Vehicle
6	Three Axle Commercial Vehicles
7	Bus/Truck
12	4 to 6 axle
15	7 or More Axle
16	Heavy Construction Machinery (HCM)/Earth Moving Equipment (EME)

Technologies Used in FASTag

- Automated Vehicle Identification (AVI) is the method for determining the identity of a vehicle when it is in the toll gate area.
- Earlier, bar codes were used.
- Current AVI systems mostly rely on Radio Frequency Identification (RFID).
- A FASTag has what is called a passive RFID chip.

Technologies Used in FASTag

- The RFID technology uses an Electronic Produce Code (EPC) through which every vehicle can be uniquely identified.
- Each EPC code, which is a 13-digit number, in the RFID-FASTag is issued by GS1 India.
- At a toll plaza, when a vehicle comes within a certain radius, the scanner is able to send out the signals and read the tag.
- Since a FASTag is pre-charged with money, it hits the payment that is inside the tag and deducts the toll amount
- National Payment Corporation of India (NPCI) ensures the data security in the case of RFID-FASTag
- Proper IT infrastructure with backend servers in a place where all the data is captured.

Working Of FASTag

- Whenever a vehicle will pass through the Electronic Toll Collection (ETC) lane of the Toll Plaza, the system will capture the FASTag details like (Tag ID , vehicle class , TID , etc.) and send it for processing to the acquiring bank.

- The acquiring bank will send a request to the National Electronic Toll Collection(NETC) Mapper to validate the tag details.

Working Of FASTag

- Once the TAG ID will get validated, NETC Mapper will respond with details like Tag Status, Vehicle class , VRN, etc. If the TAG ID is not present in NETC Mapper, it will respond as the Tag ID is not registered.

- The acquirer host will calculate the appropriate toll fare and initiate a debt request to NETC system after successful validation of Tag ID from NETC Mapper.

- NETC System will switch the debit request to the respective issuer bank for debiting the account of the customer.

Working Of FASTag

- Issuer host will debit the linked tag holder account and send an SMS alert to the tag holder. The issuer host will also send the response message to the NETC system. If the response is sent within the defined TAT, the transaction will be considered as Deemed Accepted.

- NETC system will notify the response to the acquirer host.

- Lastly, acquirer host will notify to respective toll plaza system.

NETC System


1
8
2
3
4
7
NETC
NATIONAL ELECTRONIC TOLL COLLECTION
ONLINE SWITCH
& MAPPER
5
6
Toll Plaza System
Acquirer
Issuer

Structure Of NETC

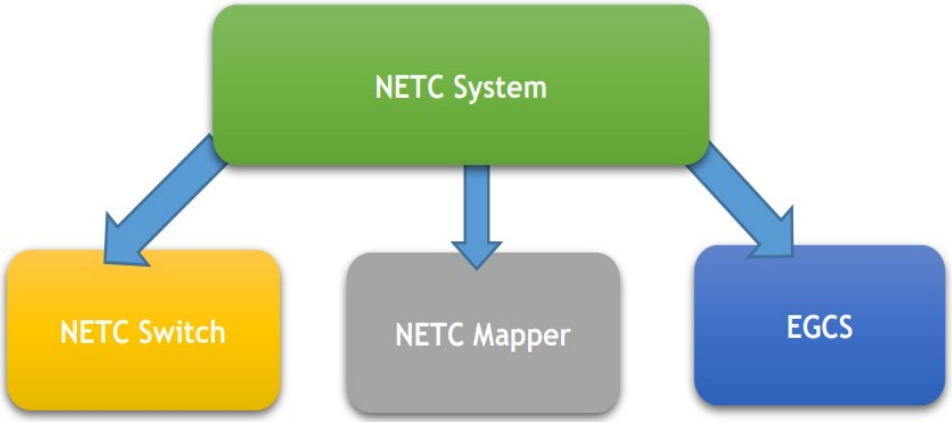
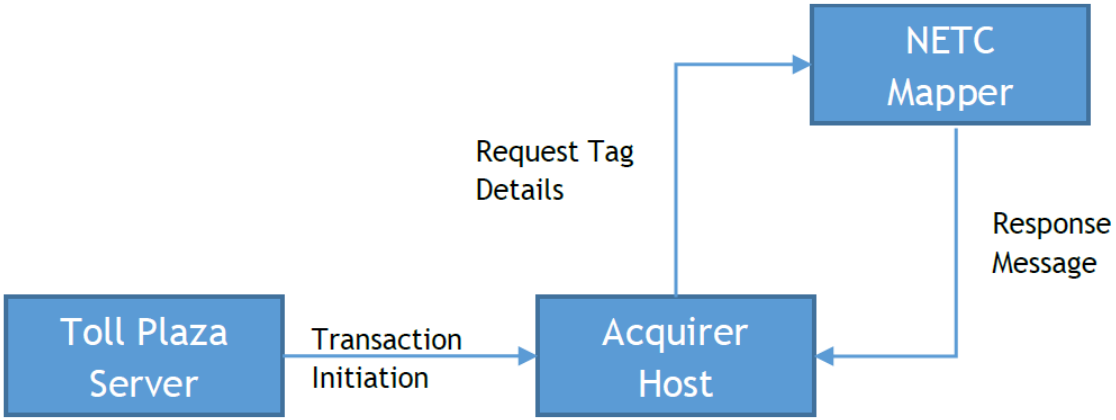


Figure 2 - NETC System

How does Acquirer obtain the tag information?

6.1 Request NETC Tag Details



How Is Toll Fare Calculated?

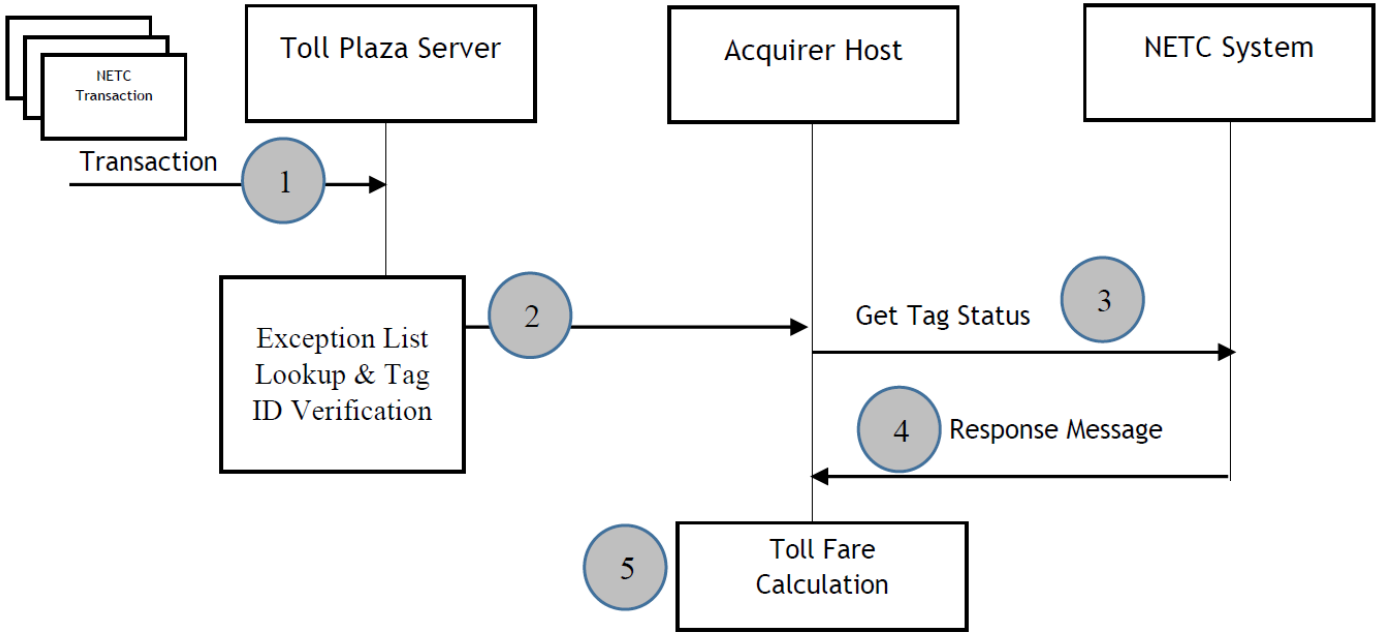
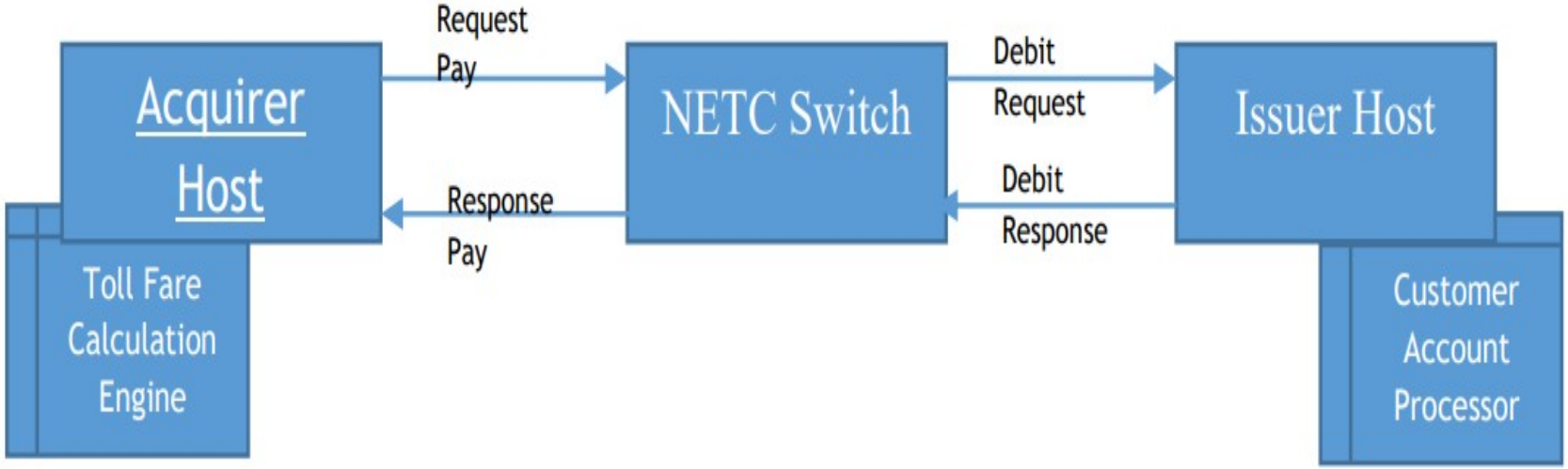
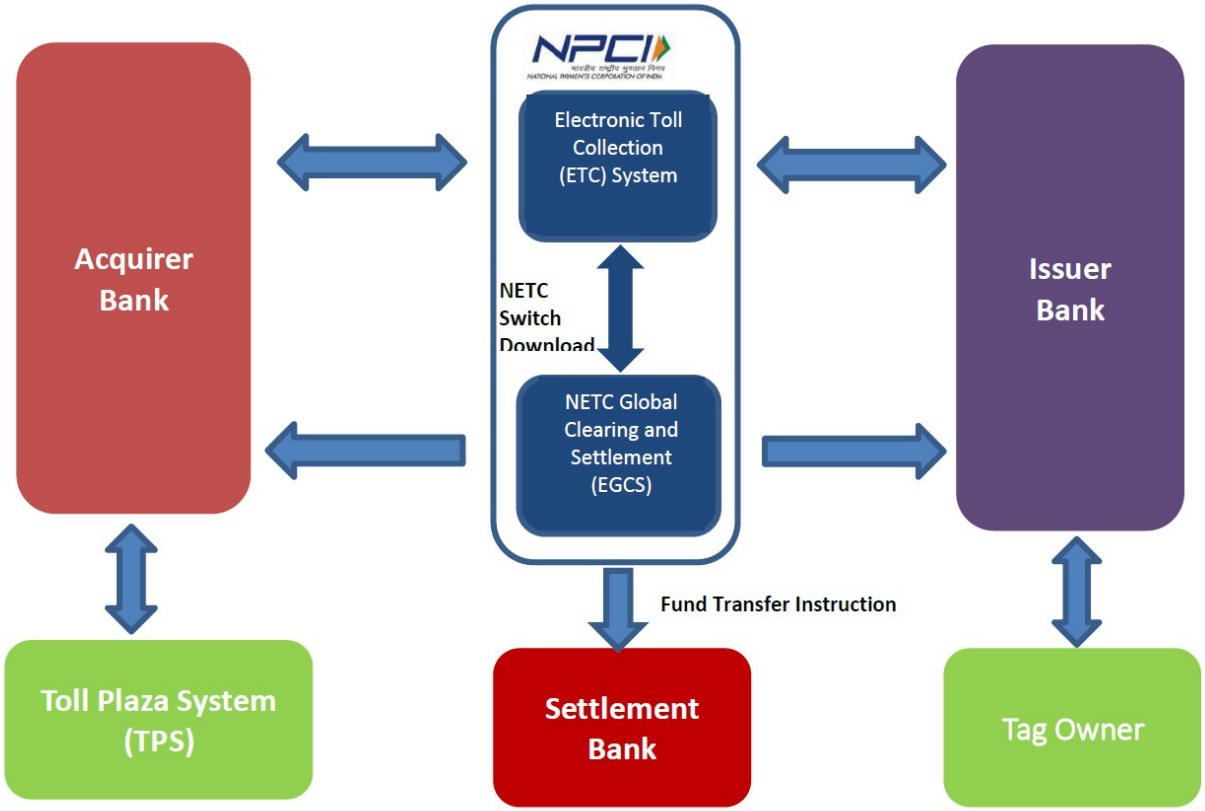


Figure 3 - Toll Fare Calculation

How is the Request Forwarded to the Issuer?



How is the exchange between



Need Of FASTag

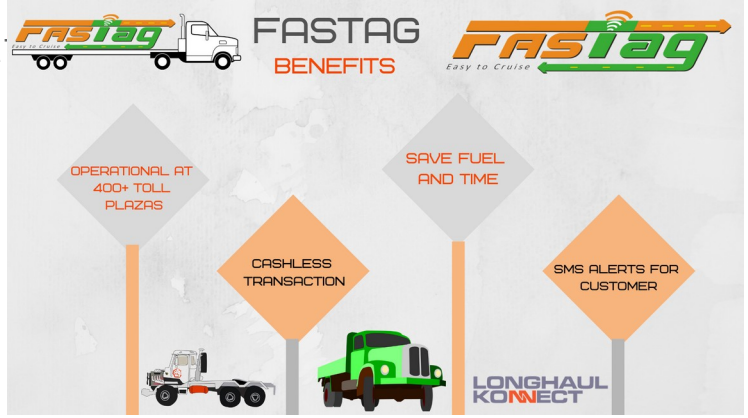
- Why is there a need of FASTag????

- A joint study in 2014-15 by the Transport Corporation of India and the IIM-Calcutta, estimated the cost of delay on Indian roads at $6.6 billion per year. The cost of additional fuel consumption due to delays was also put at $14.7 billion per year.
- If mileage can be improved by increasing fuel efficiency, improving road conditions and reducing stoppage delays, the impact on the economy could be huge.
- Also India's toll taxes are hotbeds for corruption. Transparency in the transition and cash flow can help overcome this problem.
- That's where fastag can really help a lot.

Ref: The Hindu

Benefits Of FASTag

- Ease of payment.
- Near non-stop movement of vehicles leading to lower fuel cost.
- Online Recharge FASTag can be recharged online through Credit Card / Debit Card / NEFT/ RTGS or Net banking.
- SMS alerts are sent to the FASTag holder for toll transactions, low balance, etc.
- Environmental benefit like reduced air pollution and less use of paper.
- Social benefit like less time taking toll payment is hassle-free and analytics for better highway management.
- Economic benefit like the reduced effort in management at the toll plaza and the reduced effort in monitoring centrally is also beneficial.



FASTag & Development

- Fastag has helped in easing the lives of consumers/users. It has helped in removing problems like traffic congestion, easy traffic management, saving fuel and many more.
- It has played a crucial role in growth of overall development. It has helped in giving a boost to the Cashless India policy by allowing the payment of toll tax online. Acc. to a report, the electronic toll collection is set to boost royalty by 10,000 crore per annum.
- It has also helped in saving a lot resources of the government. A lot of money used to go in the infrastructure and toll management. Also digitization of the process has made the analytics and other process easy.
- Also the government has big plans to take fastag a step forward. By 2022, they want to make each and every toll plaza digitised and equipped with FASTAG.

Ref: Economic Times

FASTag & Development

- The government took a leap in logistics by introducing e-way bills to check tax evasion by tracking the movement of goods and establishing direct linkage between what is declared and what is actually moved. Now it is trying to make the e-way bill system even stricter. It has found an innovative way to check evasion of the Goods and Services Tax (GST). It is planning to link the GST Network with FASTag mechanism of the National Highways Authority of India (NHAI) and Logistics Data Bank (LDB) services of the Delhi-Mumbai Industrial Corridor Development Corporation.

- The Central government also plans to enable the use of FASTag for a range of other facilities such as fuel payments and parking charges. Several States have already signed memoranda of understanding to join the system.

Ref: The Hindu,The Economic Times

Challenges With FASTag

- Stolen, Lost, or Damaged Tags. Since the card is affixed to your windscreen, it can be easily misplaced, damaged or stolen.
- Double-Deduction. It's possible for the toll fee to be deducted twice from your account.
- Possible Technical Glitches.
- Blacklisted FASTag
- Unauthorized Deductions Through FASTag
- Blacklisted FASTag

Other Alternatives

- Payment can be facilitated through mobile wallets, credit cards, or net banking before reaching the toll plaza through an Android application. By using image processing, we wouldn’t require any smart device to be installed at the toll plaza as the processing can be directly done from the video feed received through CCTV installed at the toll plaza.

- Or We may map the starting and finishing locations of the highway using a geographic information system and a GPS on the car that is always connected to servers, and if that car passes any reference or marked point, payment will be made automatically if that toll has not been paid for yet.

Ref: A Comparative Study of Toll Collection Systems in India

Conclusion

- In this Presentation we've seen the overview of highways in India, its importance and problems related to it, then we looked some of the solutions that can be implemented to fix those problems especially FASTag.

- We learned about the History regarding FASTag, Also we dived deep into the workings of FASTag and various technologies related to it and their working. Then we explored the need and relationship of development with FASTag and lastly in the end we talked about challenges and alternatives of FASTag

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Thank You